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Prepared By:	Mark Carrier
Approved By:	John Mills Ian Turner Charlene McKenney Gary Burce Brian Allen
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PIB

Product Information Bulletin
INTERNAL VARIAN USE ONLY

Worldwide LC Distribution

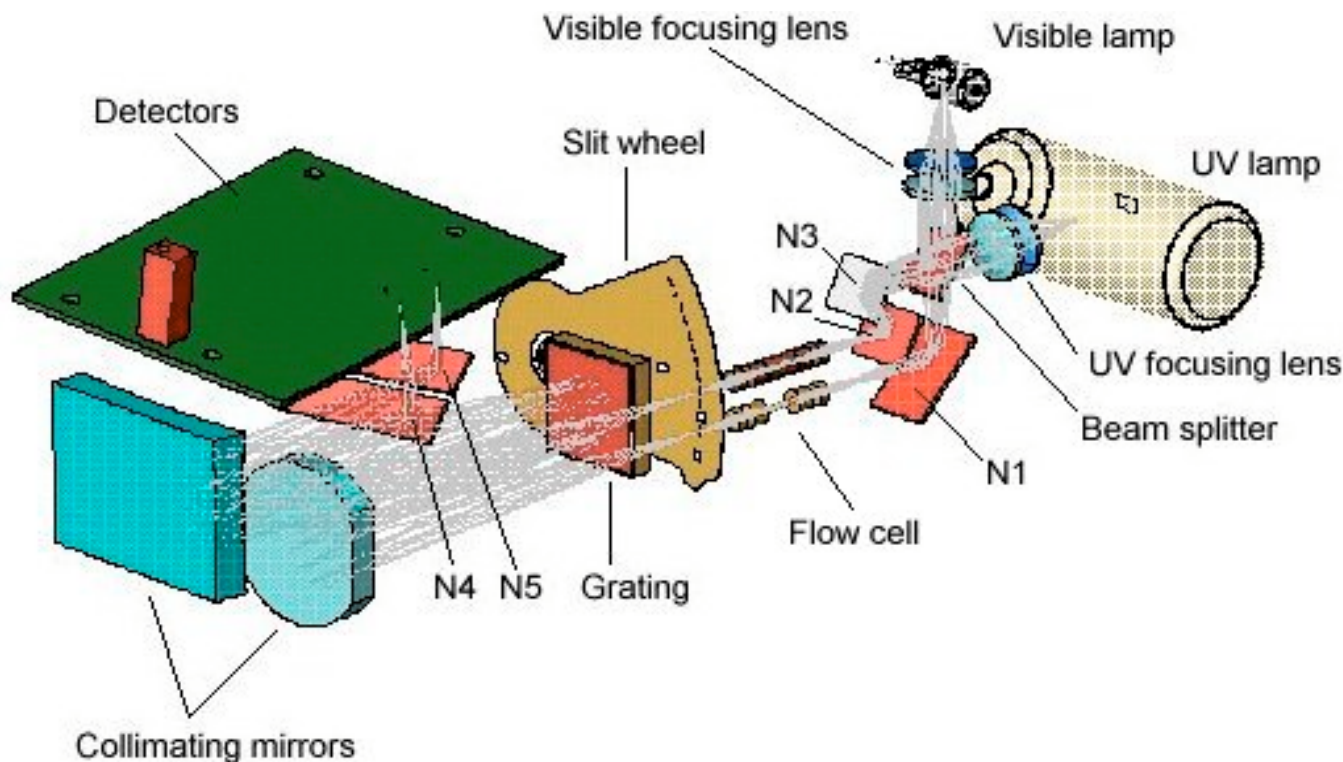
Introducing **ProStar 335 Photodiode Array Detector**



1. The ProStar 335 Photodiode Array Detector is a completely new product designed and built by Varian Inc., Melbourne to replace the current ProStar 330 Photodiode Array Detector. Since the ProStar 335 shares much of the same hardware as the ProStar 325, ordering additional parts and accessories will be simplified as this reduces the number of extra parts between the two detectors.
2. The ProStar 335 can be ordered as a single array (microbore to analytical) or dual array (analytical to preparative) for extended absorbance range.
3. The ProStar 335 can monitor all wavelengths simultaneously from 190 nm to 950 nm with a deuterium lamp for the UV range or in the visible range with a quartz halogen lamp.
4. The ProStar 335 has significantly improved signal to noise for all applications compared to the ProStar 330. Against our competitors, Waters and Agilent, the ProStar 335 ranks in the top for noise at $\pm 1.0 \times 10^{-5}$ AU
5. Programmable slit widths (1, 2, 4, 8, 16 nm) for optimizing noise or optical resolution.
6. Data from the ProStar 335 can be collected via one of the 4 ways below:
 - through an Ethernet communication cable directly to the PC
 - through an Ethernet communication cable through an Ethernet switch
 - through an analog cable to the Star 800 MIB
 - through an analog cable to the internal pump CIM
7. The functions of the ProStar 335 are controlled by Galaxie CDS/WS or Star WorkStation through Ethernet communications.
8. Peak Purity Parameter calculations, Multicomponent Analysis (MCA), and Spectral Library searches in Star Workstation are performed with the use of PolyView2000 spectral processing software

9. Peak Purity and Spectral Library searches in Galaxie.

Optics



Light Source

The 335 utilizes a high energy deuterium lamp designed to maximize light output throughput in the ultraviolet range by producing a focused beam of light through the flow cell. The visible source is a 10W quartz halogen lamp.

Dual Beam

The beam splitter creates two parallel beams emanating from two apertures in a common plane. This arrangement is ideal for combining a Vis source with the D₂ source to give a continuous source spectrum from approximately 190nm (the oxygen cutoff in air) to 950nm.

Flow Cells

The 335 features an easy access flow cell design that allows removal and installation of the cells from the front of the instrument without the need for tools.

Four flow cells are available:

- 1 Microbore, Single Path, 4mm, 1.5 μ L
- 2 Analytical, Single Path, 9 mm, 15 μ L
- 3 Preparative, Dual Path, 9mm and 1mm, (Dual array only)
- 4 Super Preparative, Dual Path, 4mm and 0.15mm, (Dual array only)

Dual focusing lenses in the flow cells minimize refractive index effects of flowing liquid.

Polychromator

The polychromator uses dual 1024 diode arrays for sample and reference channel (analytical to preparative) to give full dual cell path extended dynamic range capability. (For single array mode, two photodiodes, one centered at 250 and one centered at 500 nm, correct for variations in light output). Second order stray light is suppressed by Varian's patented Seamless Spectral Coverage Technology formed on the array windows.

ProStar 325 Introductory CD and its contents

A summary of what is included on the CD is at the end of this PIB.

Product Overview

See Technical Paper

Performance/Specifications

See the ProStar 335 Photodiode Array Detector data sheet

Competition

See **The Competition** at the end of this document

Product Positioning

The best photodiode array detector on the market

- Operates across the entire wavelength range (190 to 950 nm)
- Among the lowest in noise on the market for diode array detectors
- 3 methods of purity detection:
 1. Peak Purity Parameter calculations
 2. Multicomponent Analysis (MCA) (error analysis)
 3. Library Search

Outstanding microbore/analytical detector

Low noise for high sensitivity

Low band spreading flow cells

Choice of flow cells for microbore to analytical operation

Outstanding analytical to preparative detector

Dual path flow cells for extended range operation

High flow rate operation (up to 10 L/min)

Choice of flow cells for semi micro, analytical or preparative operation

2 programmable analog outputs for operation with fraction collectors or other devices

Single detector for both analytical and preparative applications is the ideal solution for scale-up work

Customer only needs to switch flow cells and possibly plumbing, but not the whole detector

Easiest detector to operate and maintain

Change flow cells or replace lamps from the front of the detector without tools

Full control from Star or Galaxie software

Full set of synchronization signals to work with any manufacturers' system

Needs, Features and Benefits

Customer Need: Performance

Feature	Benefit
High performance electronics and optics for lowest noise	Best sensitivity – easy to measure trace amounts
Full dual beam design to minimize drift	Best sensitivity – little baseline wander
Thermostat controlled Internal flow cell	Low band spreading for sharpest peaks and best sensitivity
Controlled optical imaging- flow cell lenses	• Insensitive to flow variations give a flatter baseline without the need to increase system volume with pulse dampening for improved results • Insensitivity to gradient changes.
Excellent Optical Resolution	Programmable slit widths of 1, 2, 4, 8 and 16 nm allow the user to optimize resolution or noise depending on the application
Seamless Spectral Coverage Technology	Eliminates 2 nd order light that can cause incorrect spectral information

Customer Need: Productivity

Feature	Benefit
Fully controlled from Star or Galaxie	Can take advantage of all automation features
9x1 flow cell can be used for analytical and prep	Can run both analytical and prep runs in automation.

Customer Need: Reliability

Feature	Benefit
Downloadable firmware	Easy to update firmware if needed
Modern reliable design including surface mounted single board system	Highest reliability of parts and manufacturing techniques.

Customer Need: Flexibility

Feature	Benefit
Analytical and prep flow cells for the same detector	One detector for both types of applications
Low back pressure flow cells	High flow rate range for prep applications
Complete set of synchronization signals and dual analog outputs	Can work with any vendor's HPLC system hardware

Customer Need: Ease of Use/Ease of Learning

Feature	Benefit
Change flow cells and lamps without the use of tools through the front panel	No need to move instruments to change lamps or flow cells. Don't need tools.
Full control through Ethernet	Simple interconnection (with no distance limit) already built into most computers
Drivers for Star or Galaxie	If you know Varian software, there is no learning curve

Customer Need: Miscellaneous

Feature	Benefit
Built by the same people who build Cary spectrophotometers	Best optical designers on the market.
Peak Purity, and Spectral Library searches capabilities in Galaxie CDS/WS software and Star Workstation	Information rich spectral data
Monetary savings	microbore to super preparative flow cells for microbore to preparative detection in one detector
Multicomponent Analysis in Star Workstation through PolyView2000	No need to fully separate peaks, therefore save time in method development and analysis

Ordering Information

When placing an order for the ProStar 335, please be aware that the unit does not come with a flow cell. The appropriate flow cell must be ordered separately. Flow cells come in a variety of configurations covering semi-micro to preparative flow rates, so make certain to order the correct one for the customer's application.

ProStar 335 Photodiode Array Detector

10083800	ProStar 335 DAD, Microbore to Analytical	Includes: Diagnostic software, manuals, PolyVerify. NOTE: Flow cell not included, either a 4x0 or 9x0 flow must be ordered below.	\$15,000
10083900	ProStar 335 DAD, Analytical to Prep	Includes: Diagnostic software, manuals, PolyVerify. NOTE: Flow cell not included, one must be ordered below.	\$18,500

ProStar 335 Photodiode Array Detector, Options and Accessories

210182100	Flow Cell 4x0, Inert (microbore)	4x0 mm, 1.5 µL, 20 mL/min max flow rate	\$1,000
210181800	Flow Cell 9x0, Inert (analytical)	9x0 mm, 15 µL, 100 mL/min max flow rate	\$1,000
210181900	Flow Cell 9x1mm, Inert (prep)	9x1 mm, 500 mL/min max flow rate	\$1,500
210182000	Flow Cell 4x0.15, Inert (super prep)	4x0.15 mm, 10 L/min max flow rate	\$1,500
110715400	D ₂ Lamp (Prealigned) 325/335	For wavelengths from 190 nm - 450 nm	\$625
5610136500	Quartz Halogen Lamp (Prealigned) 325/335	For wavelengths from 450 nm - 900 nm	\$100
210186590	325/335 Sync Interface Board Needed when instrumentation not controlled by Star WorkStation or Galaxie is not being used (Waters or Agilent). Provides: Auto Zero, Lamp Off, Start In, Start Out, Ready In, Ready Out, Fault In, Fault Out	One cable (P/N 110744100) needed per desired function	\$100
110744100	Shielded Recorder/Integrator/Contact Cable	Tinned end, 3-wire	\$19
210187590	325/335 Relay Interface Board	Provides: Peak Sense, 4 relays	One cable (01-107441-00) needed per desired function \$331
110744200	325/335 Analog Signal Cable	Provides dual channel data collection	Needed for fraction collection, external integrator, etc. \$82

Communication Accessories

392612922	Ethernet 8-port 10/100BaseT Switch	Autosensing 100 - 240 VAC power supply	\$275
392612901	Ethernet Cat. 5 patch cable, 10-foot	For 10/100BaseT Ethernet connection	\$15
392612902	Ethernet Cat. 5 patch cable, 20-foot	For 10/100BaseT Ethernet connection	\$25

Notes About Ordering

Which flow cell to order?

For dedicated microbore or analytical HPLC applications, it is recommended that the microbore (4x0, P/N 210182100) or analytical flow cell (9x0, P/N 210181800) be ordered. Also, only these flow cells should be ordered with the microbore to analytical detector. The 9x1 or 4x0.15 flow cell should never be ordered with the single array detector. Operating at flow rates best suited for these applications with the flow cells previously recommended enables the 335 to meet its given noise specifications. Using the preparative or super preparative flow cells will cause the detector to not meet its noise specifications.

Communications cable ordering

It is recommended to order an Ethernet switch (listed above) when ordering the 335. This is due to the fact that the customer may want their workstation computer to be connected to the company's network while at the same time being connected to the 335 detector. This will save the customer from having to install an additional Ethernet card in their computer. An Ethernet crossover cable is included with the 335 that allows direct connection to the workstation PC, however an Ethernet patch cable (listed above) will need to be ordered to connect the 335 to the Ethernet hub. The Ethernet patch cable can also be purchased from a local computer supply store.

Ethernet interconnect hardware is designed in two different ways. Ethernet hubs allow several Ethernet devices to be plugged into one box and one cable connected to a router on the Ethernet backbone for communication. These devices route ALL Ethernet traffic to the network before it reaches its final destination.

Ethernet switches also allow several Ethernet devices to be plugged into one box and one cable connected to a router on the Ethernet backbone for communication. However, switches have processing capabilities that provides a direct connection between devices on the same switch WITHOUT the signal going to the Ethernet backbone. This will significantly improve communications reliability if the network has heavy traffic periods. We highly recommend that switches always be used instead of Hubs to connect the ProStar 335 and its controlling PC together.

Helpful Hints

- ® If the 335 is going to be used as an analytical to preparative detector, an analog cable should be ordered. Connect one output to the fraction collector and one to the CIM on the pump. This will display a chromatogram in Star Workstation's Dynamax window.
- ® If the ProStar 335 is connected directly to the PC, it will always start when the rest of the modules start. If the ProStar 335 is connected to a hub or network, network traffic may slow down the start command from being transferred from the PC to the 335. The result will be a variability in retention times for different chromatograms, although all of the peaks should be offset by the same amount. The areas, heights and peak shapes will not be effected. If this happens routinely, change from a hub to an Ethernet switch for interconnecting the Prostar 335 and the PC to the network. If it is still a problem, the sync board may need to be added and a contact closure cable from the pump or autosampler connected to the start input of the ProStar 335. Nothing further needs to be done in this configuration.
- ® Notes on competition section:

The spectral resolution is really a slit width. No one has that spectral resolution. We do not have a 1 nm resolution. It is more like 2.7 nm. Waters is more like 4.5. Agilent is somewhere in the middle. Compare the slits, as they are real. Compare the diodes per nm in terms of wavelength range. For that, the ProStar 330 has variable diodes per nm because of the non linear dispersion.

The Competition

	Waters	Agilent	Varian 330	Varian 335 (*Typical)
λ Range (nm)	190-800	190-950	190-800	190-950
Light Source	D ₂	D ₂ , W	D ₂	D ₂ , Quartz Halogen
Digital Resolution	1.2 nm - 600 nm (2D mode)	*****		1 nm
λ Accuracy	± 1 nm	± 1 nm, self-calibration with D2 lines, verification with Holmium oxide filter	±1 nm (at 253.7 nm)	± 1 nm, 656 D ₂ line, verified with the 486 D ₂ line
Linearity Range	≤ 5% at 2 AU Propyl paraben, 257 nm	> 2 AU upper limit	<5% at 1.6 AU (wavelength 250 nm)	≤5% to 2AU, >2.5AU Upper Limit
Noise (AU peak to peak)	± 1.5x10 ⁻⁵	± 1x10 ⁻⁵	1.5 x 10 ⁻⁵ AU or less: 250 nm	± 1x10 ⁻⁵
Drift	<1x10 ⁻³ AU/hr/°C, dry cell at 254 nm	2x10 ⁻³ AU/hr at 254 nm	1x10 ⁻³ AU or less (2 hour warm up)	≤1x10 ⁻³ AU/hr (1 hour warm up)
Sensitivity Setting Range	0.0001-2.0000 AUFS (under software control)	*****		Software (1uAU to 100 AU)
Filter Setting Range	0, 0.1, 0.2, 0.5, 1, 2, 3	0.2,0.5, 1.0, 2.0, 4.0, 8.0, 16 sec		0.05, 0.5, 1.0, 2.0
Slit width	1.2 nm fixed	Programmable: 1, 2, 4, 8, 16 nm	Programmable: 1, 2, 4, 8, 16 nm	Programmable: 1, 2, 4, 8, 16 nm
Diode width	*****	< 1 nm		<1 nm
λ Precision	*****	*****		0.5 nm

* Final specifications will be published in the ProStar 335 Photodiode Array Detector data sheet

Flow Cells

- Pathlengths: single and dual, interchangeable
- Single pathlength flow cells: Semi-Micro 4 mm, 1.5 μ L; analytical 9 mm, 15 μ L
- Dual pathlength flow cells: preparative 9 mm x 1 mm; Super Preparative 4 mm x 0.15 mm
- Maximum flow rate:
 - ❑ Microbore flow cell: 20 mL/min
 - ❑ Analytical flow cell: 100 mL/min
 - ❑ Preparative flow cell: 500 mL/min
 - ❑ Super Preparative flow cell: 10 L/min
- Pressure: 1000 psi maximum

Control

- External: Ethernet
- Contact closure outputs: four time-programmable external event relays, one peak sense relay, three synchronization signals (ready out, start out, and fault out)
- Contact closure inputs: lamp off, autozero, three synchronization signals (ready in, start in, and fault in)
- Software: Star Workstation; Galaxie Workstation; Galaxie Chromatography Data System; handheld computer
- Dual channel purity parameter calculation: peak detection through Star or Galaxie software

Environment

- Operation: 10 °C to 35 °C; relative humidity from 5% to 95%
- Non-operational storage: -20 °C to 65 °C

Dimensions and Weight

- Size: 8.3 in./21.1 cm (h) x 11.7 in./29.6 cm (w) x 18.7 in./47.7 cm (d)
- Weight: 34.2 lb/15.5 kg

Introductory CD Contents

PIB

Sales PowerPoint presentation

Data Sheet

Technical papers

- Hardware overview
- Analytical to Prep.
- Spectral processing

Hardware operation manual

335 Software CD contents:

- Star Driver
- Galaxie Driver
- PolyVerify
- Diagnostics
- Star Driver operation manual
- Galaxie Driver operation manual

Demo. data files

Software videos

Hardware videos

Photos and diagrams

Service manual

Service strategy document

Pre-installation manual

Firmware